

Achieving Breakthrough Value for Server Virtualization

Microsoft and Intel are bringing mainframe technology
into mainstream computing environments.

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Microsoft Virtual Server® 2005 R2 running on 64-bit, Dual-Core Intel® Xeon® processor-based servers is a cost-effective, enterprise-class virtualization solution helping companies of all sizes transform their server infrastructures to improve flexibility and reduce total costs. The combined platform has been extensively integrated, optimized, and validated. It can be deployed with confidence in production environments today, and provides a migration path to next-generation products that will deliver increasing value.

May 2006

Executive Summary

Tens of thousands of companies are taking advantage of today's server virtualization solutions to consolidate their infrastructures, reduce their total costs, and improve business and IT agility.

Microsoft Virtual Server® 2005 R2 running on Intel® Xeon® processor-based servers provides an optimized, enterprise-class solution that can help IT organizations deploy virtualization with confidence across a broader range of production scenarios, while reducing total costs and delivering a better return on their investment.

Intel and Microsoft® have invested heavily in optimizing, testing, validating, and supporting combined solutions to deliver highest levels of performance, interoperability, and reliability in today's complex server environments. Businesses can consolidate multiple Microsoft and third-party operating systems (OSs) and application stacks onto powerful 64-bit, Dual-Core Intel Xeon processor-based servers, and use familiar management tools to accelerate provisioning and simplify workload management. Cost of implementation is low when compared to other virtualization solutions, and Microsoft and Intel provide extensive support to simplify deployment and enable highest levels of availability for applications running in virtual machines.

The exceptional value of today's Intel and Microsoft virtualization solution is just a first step toward delivering sophisticated, ubiquitous virtualization capabilities in every business computing platform. Microsoft is focused on building comprehensive virtualization support into its next-generation server operating system (OS), with the goal of making Windows Server™ the most scalable, secure, and flexible platform for virtualization. Meanwhile, Intel is providing an increasingly robust hardware foundation with Intel® Virtualization Technology (Intel® VT), multi-core processors, and a variety of complementary platform innovations that help further improve performance and reliability across diverse applications and workloads.

With support and innovations offered by both Intel and Microsoft, businesses can deploy affordable, standards-based virtualization solutions today; and they count on a smooth, cost-effective migration path that will deliver increasing value in years to come.

Benefits of Server Virtualization

Virtualization on industry-standards-based servers very quickly has become a mainstream tool for tackling some of today's most critical IT challenges. It is helping IT organizations reduce capital and operating costs, simplify and modernize their infrastructure, and respond more quickly to business needs (Figure 1). As analysts from Forrester Research stated in a recent report, virtualization is well past the early-adoption phase, and today's solutions deliver practical benefits across a wide range of business and IT environments.¹

- **Cost-effective Consolidation**—Multiple OSs and applications can be hosted on each physical server to improve utilization, integration, and manageability.
- **Simple Legacy Migration**—Legacy applications (and their legacy OSs) can be re-hosted on new servers without software modification. This helps IT organizations reduce cost and risk of infrastructure modernization, and makes it easier to standardize server hardware without limiting software options.
- **Faster Provisioning**—A new virtual machine (VM) can be configured on an existing physical server in minutes to deploy new applications or increase capacity for existing solutions. Complete software stacks, including state information, can be cloned and transferred across the network as individual files.

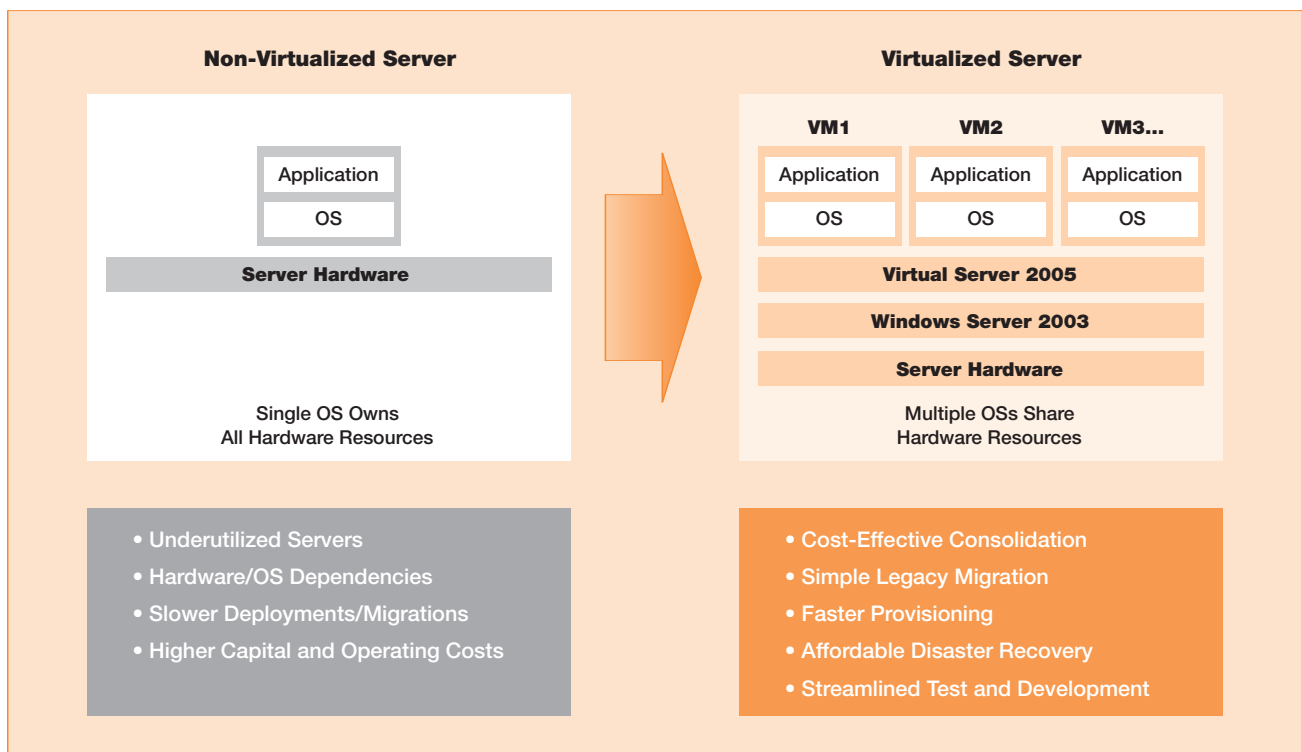


Figure 1. With Microsoft Virtual Server 2005 R2 running on Intel Xeon processor-based servers, IT organizations can consolidate diverse OSs and applications on a single server to simplify their infrastructure and address some of their most critical IT challenges.

¹ Source: Server Virtualization Goes Mainstream, by Frank E. Gillett and Galen Schreck, Forrester Research, February 22, 2006. Available for purchase at: www.forrester.com/Research/Document/Excerpt/0,7211,38634,00.html

- **Affordable Disaster Recovery**—With virtual machine fail-over to an alternate shared server, it is no longer necessary for hardware at the backup site to exactly duplicate the production hardware. Disaster recovery is simpler and less costly, and Microsoft's free licensing for standby virtual machines drives down costs even further.
- **Streamlined Test and Development**—Multiple software iterations, and even entire multitier network environments, can be run on a single physical server. Provisioning and rollbacks are simplified, less hardware is required, and existing systems can be repurposed very quickly as needs change.

Virtualizing with Confidence

Because server virtualization delivers significant benefits when compared to the traditional one-application-per-server approach, adoption rates are increasing rapidly. Yet much can be done to make today's virtualization solutions simpler, more reliable, and more affordable. Intel and Microsoft have made significant advances, both individually and collaboratively.

With Microsoft Virtual Server 2005 R2 running on Intel Xeon processor-based servers, businesses now can take advantage of an affordable, thoroughly integrated virtualization solution running on the world's most widely deployed hardware and software architecture. They can manage their physical and virtual infrastructure using familiar tools, and they can count on comprehensive support from both Microsoft and Intel.

Perhaps most important, Microsoft and Intel develop, integrate, test, and support the combined hardware and software solution to deliver value across an enormous range of scenarios. Over the past 20 years, the two companies have had more than 200,000 developers working together on combined solutions, and this collaboration continues with today's virtualization technologies. Each company also maintains testing and quality assurance programs that are among the most extensive in the

industry, and Microsoft is strongly focused on validating its major server applications running in virtual machines on Intel Xeon processor-based servers (many already have been validated; others are in progress today).²

As a result, IT organizations can virtualize and consolidate their Microsoft applications—SQL Server, Exchange Server, Live Communications Server, Biz Talk Server, etc.—with greater confidence and less in-house testing. As new beta versions are released for other Microsoft server applications, they also will have been validated extensively on the combined platform, opening the door to even broader use of virtualization in production environments.

The value of Intel and Microsoft virtualization solutions will continue to increase. Within a few years, virtualization will be a feature of every Microsoft server OS running on an Intel Xeon processor-based server. That means businesses can standardize on an affordable virtualization solution today, knowing they have a smooth migration path to next-generation capabilities.

“This technology [server virtualization] will create immediate benefits for companies—and launch them on a major transformation of IT infrastructure over the next five years.”

— Frank E. Gillett and
Galen Schreck,
Forrester Research,
February 22, 2006³

² The Windows Server System™ Common Engineering Criteria 2005 states, “To help customers improve the utilization of hardware resources, all server products will support Microsoft Virtual Server 2005. Each product must be capable of running from within a virtual instance.” Exceptions are granted under some conditions. For details, see the Microsoft Web site: www.microsoft.com/windowsserversystem/cer/allcriteria.mspx#ESD

³ Source: Server Virtualization Goes Mainstream, by Frank E. Gillett and Galen Schreck, Forrester Research, February 22, 2006. Available for purchase at: www.forrester.com/Research/Document/Excerpt/0,7211,38634,00.html

Optimized Software Support

Microsoft Virtual Server 2005 R2 is the most cost-effective server virtualization solution engineered for the Windows Server System™ Platform. It runs on top of Microsoft Windows® Server 2003 and is optimized for Intel Xeon processor-based servers with up to 32 processors. It supports a wide variety of unmodified IA-32 OSs running as “guests,” including Windows NT® 4.0, Windows Server 2000, Windows Server 2003, and multiple distributions of Linux. This gives IT organizations considerable flexibility for consolidating complex, multi-OS environments.

COMPREHENSIVE SOLUTION STACKS

Virtual Server 2005 has been included in Microsoft’s Common Engineering Criteria for two years. These criteria were designed to deliver comprehensive server solutions that reduce complexity and help improve interoperability, security, reliability, and manageability in today’s datacenters. In virtualization, they mandate that all applications in the Windows Server System Platform (e.g., SQL Server, Exchange Server, etc.) be supported running in virtual machines on current and future versions of Microsoft Virtual Server.⁴ The entire software stack (OS, Virtual Server, applications and management tools) is extensively tested to ensure all layers work cohesively together.

“Intel and Microsoft are delivering tuned and validated virtualization solutions that enable successful deployment across a broad range of usage models. Intel Virtualization Technology, in conjunction with Microsoft’s OSs, management tools, and Windows hypervisor technology, provide a strong foundation for cost-effective and reliable implementation.”

– Pat Gelsinger
Senior Vice President,
General Manager,
Digital Enterprise Group,
Intel Corporation

Virtual Server 2005 R2 also runs on all servers in the Windows Server Catalog (www.microsoft.com/windows/catalog/server/). This includes thousands of servers and peripherals, and the list grows continuously as new systems enter the marketplace. Combined with the breadth and depth of vendor support for Intel Xeon processor-based servers, this gives companies great flexibility for configuring their servers to match specific needs. They can choose from small, 2-way servers and blades, to systems with up to 32 processors, large memory configurations, and extensive high-availability features. There is no need for specialized or limited hardware or software environments, and customers are better able to leverage their existing server, storage, network, and security infrastructures.

Virtual Server 2005 R2 is also integrated with:

- **Microsoft Active Directory**—For coordinated directory management of virtual and physical servers.
- **Microsoft Operations Manager (MOM)**—For automated monitoring and management support. A MOM service pack has been available for Virtual Server for some time, and recently has been upgraded to deliver optimized support for Virtual Server 2005 R2 service pack 1.
- **Microsoft Systems Management Server (SMS)**—For integrated management of physical and virtual servers.

Virtual Server includes a full-featured application programming interface (API) that enables scripted control of all aspects of virtual server management. It already has been incorporated into many leading third-party management applications, and can be used by business customers to automate management tasks using the same tools and applications they use to manage their physical servers. Combined with the advanced instrumentation built into all Intel Xeon processor-based servers, this gives companies effective tools for automating management and reducing costs across both their virtual and physical systems.

⁴ There are a few, relatively minor exceptions unlikely to impact most organizations. For details, and for information about Microsoft’s long-term roadmap, visit: www.microsoft.com/windowsserversystem/cer/default.mspix

EXTENSIVE SUPPORT FOR MICROSOFT AND LINUX GUEST OSs

Microsoft offers extensive support for Microsoft's OSs and for a number of Linux distributions running in Virtual Server 2005 R2. This is an important consideration. It can help organizations virtualize and consolidate heterogeneous environments more smoothly and reliably, and give them greater flexibility going forward. (Microsoft also offers free virtual machine add-ins for Linux that can improve the experience of running qualified Linux versions in virtual machines.) Additional resources and support are available on the Microsoft Developers Network (<http://msdn.microsoft.com/developercenters/>).

AFFORDABLE PRICING

Virtual Server 2005 R2 is now available as a free download, and Microsoft has modernized its OS and application licensing policies in ways that dramatically reduce total cost of implementation and use. The result is an enterprise-class virtualization solution robust and affordable enough to be deployed in almost any environment.

- **Four OS Instances per License**—With Windows Server 2003 R2 Enterprise Edition, customers can run up to four virtual OSs on one physical server at no additional cost.
- **Free Standby OS Instances**—There is no Microsoft license fee for OS instances installed in a non-running VM, so businesses can deploy standby VMs for high availability without additional fees.
- **Licensing per Virtual Processor**—Application licenses are based on the number of virtual processors assigned to the VM in which the application runs, rather than on the total number of physical processors in the server. This can dramatically reduce licensing costs for Microsoft applications running on VMs in 2-way, 4-way, 16-way, or larger servers. Microsoft also counts a multi-core processor as a single processor for licensing purposes, whereas many software vendors base their licensing fees on the total number of cores. Microsoft's approach enables businesses to take advantage of the enhanced density and performance of multi-core Intel Xeon processors, without increasing their software licensing costs.

Virtualization in Action

ATLANTICARE

- 16:1 Consolidation Ratio
- Reduced Capital and Operating Costs
- Faster New Deployments and Simplified Migrations

"I estimate that we can host more than 100 virtual machines on these three 8-way boxes. That will cover our expansion needs for a long time."

— Roger Vann, Technical Project Manager, AtlantiCare

A prominent New Jersey healthcare organization needed more datacenter capacity for new applications and to support a major migration to Microsoft OSs and applications (during the migration, the new versions would have to run side by side with production systems). Rather than upgrade its facilities, the company consolidated multiple applications onto two 8-way Intel Xeon processor MP-based servers, using Microsoft Virtual Server. *"We are currently running 25 virtual machines on one physical device and 8 on another without coming close to maxing out the CPU resources,"* says Roger Vann, technical project manager for AtlantiCare.

IT staff found the solution powerful and easy to learn. They not only avoided the cost and disruption of a datacenter expansion but have reduced hardware, electrical power, and server management overhead; can deploy a new virtual machine in minutes; and have plenty of headroom to support new applications and growing workloads. According to Vann, *"When we need a server, it's there. The IT staff can respond to customer requests much faster, and, ultimately, AtlantiCare can respond to opportunities faster."*

Read the complete Microsoft case study:

<http://members.microsoft.com/CustomerEvidence/Search/EvidenceDetails.aspx?EvidenceID=3561&LanguageID=1>

Better Hardware Foundation

Virtualization places heavy demands on today's server platforms, requiring higher performance, capacity, and reliability to satisfy needs of multiple, business-critical applications and OSs running on a single server. Intel takes a comprehensive approach to addressing these needs, providing integrated, advanced server platform technologies that help businesses run more VMs and heavier workloads with greater reliability.

INTEL VIRTUALIZATION TECHNOLOGY

Today's OSs were designed to have full control over server hardware resources, so virtualization software must perform a complex set of tasks to enable multiple OSs to run together without conflicts. Two approaches are commonly used. The first, known as paravirtualization, relies on software changes to guest OSs. The second relies on software translation during runtime to intercept and resolve potential conflicts.

Both approaches have their drawbacks. Since paravirtualization requires modification to guest OSs, it limits ability to support legacy software and can introduce reliability issues.⁵ Software translation during runtime is compute-intensive and requires significant amounts of memory. It also requires coordinated development (and patching) of virtualization software and guest OSs to ensure reliable operation.

Intel Virtualization Technology adds silicon-level support and is fully compatible with Microsoft Virtual Server 2005 R2 service pack 1. With this support, the virtualization software (known as the Virtual Machine Monitor, or VMM) runs in a new, privileged space, while guest OSs run in their traditional space. This eliminates the need for paravirtualization and greatly reduces need for software translation. Many potential conflicts are eliminated and guest OSs can run unmodified and directly on the hardware. Because handoffs between the VMM and guest OSs are supported in silicon, there is no longer a need for complex, compute-intensive software transitions.

Benefits include (see Table 1):

- **Improved Interoperability and Performance for Unmodified Guest OSs**—For Microsoft Virtual Server 2005 R2 service pack 1, this means enhanced support for Linux and other IA-32 compatible OSs. Windows Server™ virtualization, the next-generation virtualization technology from Microsoft, will include support for 64-bit guest OSs.
- **Reduced Support Costs**—Because unmodified guest OSs run more reliably, there is no need to modify them.⁶ It is also no longer necessary for IT organizations to synchronize VMM and OS patches and upgrades.

Software-Only Virtualization	Virtualization with Intel Virtualization Technology	Benefits
Paravirtualization (modification of guest OS) required with some OSs	<ul style="list-style-type: none">• No paravirtualization required• Guest OSs run directly on hardware	<ul style="list-style-type: none">• Simpler legacy migrations• Lower support/maintenance costs• Guest OS updates no longer require VMM technical expertise
Large memory overhead	Hardware assistance reduces memory requirements	<ul style="list-style-type: none">• Lower TCO due to lower platform, energy, cooling, maintenance, and inventory costs
Limited OS support	OSs run on their intended hardware layer, which increases OS compatibility	<ul style="list-style-type: none">• Simpler legacy migrations• Better support for mixed Linux and Windows environments
Complex virtualization software	Hardware assistance simplifies software requirements	<ul style="list-style-type: none">• Smaller software footprint• Lower cost• Faster innovation

Table 1. Better Solutions with Intel Virtualization Technology

⁵ Because I/O device drivers run as part of the host OS or the hypervisor, the guest OS loses control over direct memory access (DMA) operations, which raises the possibility of memory corruption.

⁶ Although patching is no longer necessary for interoperability, it is still important to apply appropriate security patches to guest OSs.

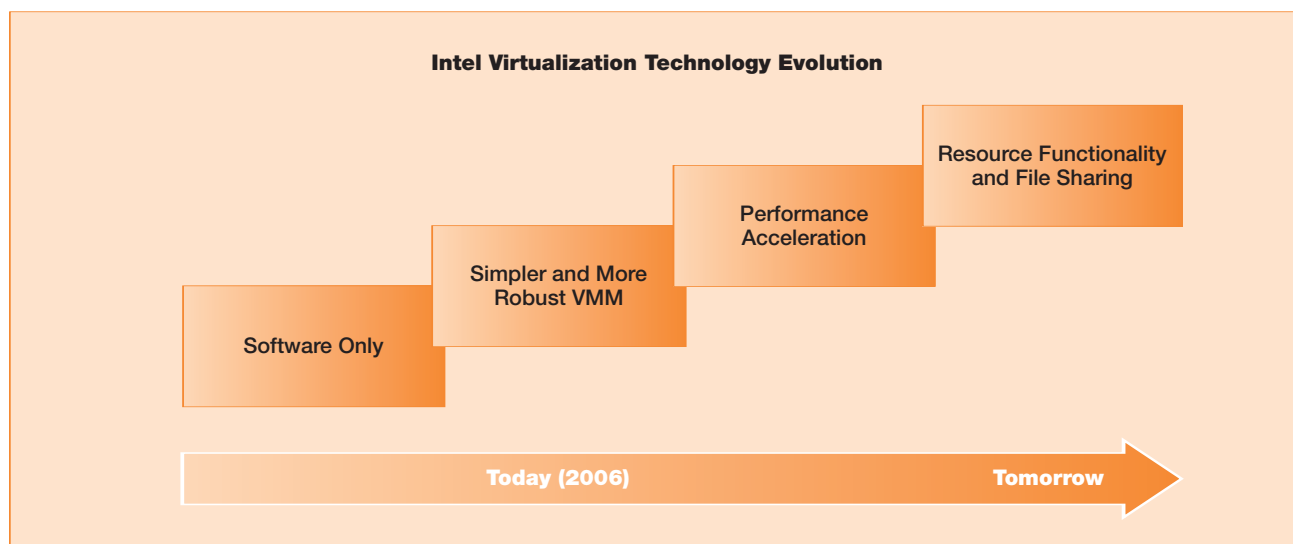


Figure 2. Intel Virtualization Technology enables simpler and more robust virtualization solutions today, and will evolve to deliver increasing benefits over time.

- **Faster Innovation**—Microsoft can spend more time delivering new features and capabilities, and less time on software development and optimization for diverse guest OSs.

Intel Virtualization Technology is supported today in new Dual-Core Intel Xeon processor-based servers, and is just the first step in a multigenerational roadmap of increasingly powerful virtualization enhancements (Figure 2). A specification already has been published for Intel® Virtualization Technology for Directed I/O (Intel® VT-d), which will help increase performance, scalability, and robustness of data movement in virtual environments. Microsoft collaborated with Intel in developing this specification and will provide software support in future versions of its virtualization products.

Efforts are under way to develop and integrate additional hardware enhancements that will continue to improve the performance, functionality, and value of virtualization on Intel processor-based servers. Intel is also driving parallel innovation in processor, memory, I/O, and storage technologies, to enhance the ability of the entire platform to host multiple business-critical applications efficiently and reliably.

“Intel Virtualization Technology simplifies our virtualization software, reducing the complexity of the trusted computing base—the software that runs directly on the metal. This makes virtualization a mainstream technology that can be widely deployed.”

— Mike Neil,
Product Unit Manager for
Microsoft Virtual Server,
Microsoft Windows
Virtualization and
Microsoft Virtual PC

ALLSTATE

- Reduced Server Growth Rates by up to 50 Percent
- Reduced Provisioning Times from Weeks to Days
- Estimates Millions of Dollar in Savings over 5 Years

“With Virtual Server 2005, if we have a host server available, the procurement time of six to eight weeks is completely eliminated. This will help IT be more responsive to the business units.”

— Najam Usmani, Consultant, Allstate Insurance Company

With typical server utilization rates of less than 10 percent, Allstate was adding hundreds of servers to its datacenters every year, and facing an imminent need for new facilities. Instead, the largest insurer in the United States launched a server consolidation project using Microsoft Virtual Server 2005 running on Intel Xeon processor-based servers. The project focused on Allstate’s test and development environment, which accounted for about a third of its 3,500 servers, and requires constant provisioning and repurposing of systems to handle changing test scenarios.

During pilot tests, the company found that from 6 to 10 virtual machines running a mix of databases, Web servers, and application servers could be deployed per physical server and would deliver excellent responsiveness and stability. Server utilization rose to 35 to 50 percent during workload peaks, server acquisition times were eliminated, and server OS deployment times went from as much as 3 hours to just 5 to 10 minutes. Most important, Allstate finds it can significantly expand the range and value of its testing efforts, while reducing costs by several million dollars over a 5-year period.

Read the complete Microsoft case study:

http://download.microsoft.com/documents/customerevidence/7118_Allstate_Virtual_Server_CS_Final.doc

64-BIT MULTI-CORE PROCESSORS

Consolidation ratios on Microsoft Virtual Server are limited only by available hardware resources. Servers based on today’s 64-bit, Dual-Core Intel Xeon processors with Hyper-Threading Technology can help IT organizations support heavier workloads and more VMs per server, while conserving datacenter space, power, and cooling resources.

- **64-Bits**—64-bit Intel Xeon processors support both 64-bit and 32-bit versions of Microsoft Virtual Server 2005 R2 (and Windows Server 2003). The 64-bit versions can directly address up to 1TB of memory, versus only about 4GB for the 32-bit versions. IT organizations can deploy larger memory configurations to support more VMs per server and to increase performance for Microsoft SQL Server and other data-intensive applications.
- **Multi-Core Processors**—Today’s Dual-Core Intel Xeon processors deliver nearly twice the processing potential of comparable single-core versions. Servers based on these processors are widely available today, and Intel has successfully demonstrated servers based on quad-core Intel Xeon processors at the Intel Developers Forum. Microsoft Virtual Server allows these additional resources to be allocated efficiently among large numbers of VMs to increase consolidation ratios. In addition, Microsoft Virtual Server and Microsoft Windows Server 2003 are multi-threaded, so they can make efficient use of multiple cores to accelerate essential OS and VMM functions. This delivers additional performance advantages across all consolidated applications.
- **Hyper-Threading Technology**—Intel Xeon processors with Hyper-Threading Technology can handle two software threads per processor core (e.g., a single dual-core processor with Hyper-Threading Technology can process four simultaneous software threads). These resources are shared easily among multiple VMs, providing an even more powerful platform for virtualization and consolidation. Here again, flexible resource allocation of Virtual Server 2005 R2, combined with multi-threaded capabilities of Microsoft’s OSs and applications, helps turn these additional platform resources into greater workload capacity and faster application performance.

ADVANCED PLATFORM TECHNOLOGIES AND STRATEGIES

Virtualization and consolidation put more pressure on the entire server platform, not just the processors. Optimized memory

and I/O technologies are important to avoid bottlenecks that could slow down all of the applications running on the server. The quality and reliability of the platform as a whole also become more important to avoid hardware failures that could simultaneously bring down multiple applications.

Intel delivers a number of technologies and strategies to address these concerns:

- **Balanced Platform Innovation**—Intel drives innovation across the full server platform so that bottlenecks in one area do not constrain advances in another. Current examples include next-generation bus architectures, PCI Express®, DDR2 memory, Fully-Buffered DIMMs, and Intel® I/O Acceleration Technology, which will improve data transport by up to 30 percent.⁷ Intel also offers dual- and quad-port network interface cards (NICs) that deliver the flexible, reliable connectivity needed to support multiple, network-intensive applications.⁸ Because different Microsoft applications and workloads place different demands on the platform, this comprehensive approach helps deliver better performance and capacity across a wider range of consolidation scenarios.
- **Leading RAS Capabilities**—Intel integrates extensive reliability, availability, and serviceability (RAS) features into all its server platforms,⁹ and works with server vendors to enable broad support for platform-level RAS features, such as redundant and hot plug components, memory mirroring, and processor lock-step support. This complements the extensive high-availability support provided by Microsoft, which includes ability to cluster both virtual machines and physical machines to avoid planned and unplanned downtime. With robust support in both hardware and software, IT organizations can configure their solutions as needed to meet service-level requirements for multiple, business-critical applications running on the same system.
- **Proven Quality**—Intel has one of the most extensive test and validation programs in the world, and works with Microsoft and other software and hardware vendors to share data and coordinate testing. With more than 40 million Intel processor-based servers deployed worldwide, Intel has a proven track record for delivering reliable and compatible computing solutions for the widest variety of IT environments. As businesses consolidate increasing numbers of applications per server, this proven reliability can be an essential advantage.
- **Software Compatibility and Optimization**—Compatibility is important in any implementation, and even more so in virtualized environments, because the VMM software adds an additional layer of complexity. Intel and Microsoft work with thousands of independent software developers to deliver the widest range of compatible applications that can be deployed with confidence in virtual machines. Intel also offers advanced software optimization tools and services widely used by Microsoft and other third-party software vendors to optimize their applications for Intel processor-based servers (see www.intel.com/software). These efforts help improve performance and increase compatibility as businesses work to virtualize and consolidate their infrastructure.

Standards-based Virtualization Today

Microsoft and Intel provide an open, fully documented virtualization solution on the industry's mostly widely deployed hardware and software platform.

- **Intel Virtualization Technology**—The specification is published and widely supported:
 - Intel Virtualization Technology specification:
<ftp://download.intel.com/technology/computing/vptech/C97063-002.pdf>
 - Intel Virtualization Technology for Directed I/O specification:
[ftp://download.intel.com/technology/computing/vptech/Intel\(r\) VT for Direct IO.pdf](ftp://download.intel.com/technology/computing/vptech/Intel(r) VT for Direct IO.pdf)
- **Microsoft's Virtual Hard Disk (VHD)**—This format for storing virtual machine configurations is published and available to software developers without cost:
www.microsoft.com/windowsserversystem/virtualserver/techinfo/vhdspec.mspx
- **Microsoft's COM API (Application Programming Interface)**—This API for enabling programmatic control of Virtual Server 2005 R2 is also published, and widely supported, by third-party developers.

Microsoft and Intel both offer extensive additional resources for developing, testing, and supporting virtualization and consolidation on Virtual Server 2005 R2 and Intel processor-based servers (see the *Additional Resources* section at the end of this paper).

⁷ For more information on Intel I/O Acceleration Technology, visit the Intel Web site at: www.intel.com/technology/iaoacceleration/index.htm

⁸ For more information on the importance of multi-port NICs in a virtual infrastructure, read the Intel white paper, *Improving IT Management with Multi-Port NICs and a Virtual Infrastructure*: www.intel.com/network/connectivity/resources/doc_library/white_papers/intel_vmware_wp.pdf

⁹ For details about the leading RAS capabilities of Intel processor-based servers, see the Intel white paper, *Reliability, Availability and Serviceability for the Always on Enterprise*: www.intel.com/business/bss/products/server/ras.pdf

Roadmap for Growth

Intel and Microsoft have a shared goal of making virtualization a ubiquitous, affordable, and robust capability in every business computing platform. As described throughout this paper, Microsoft Virtual Server 2005 R2 running on Intel Xeon processor-based platforms offers important progress in that direction.

Microsoft Virtual Server 2005 R2 service pack 1 (beta 1 is currently available for public beta testing and RTM is scheduled for 1st quarter 2007) will add another critical step. By including support for Intel Virtualization Technology, it will increase performance and interoperability for non-Microsoft guest OSs, and enable Microsoft guest OSs to be installed roughly three times faster than today. It will also support volume shadow services, to enable snapshots of running VMs for simpler, automated backup solutions.

Another major step in this progression will come with the release of Windows Server virtualization, where virtualization capabilities will be built in as a feature of the OS. This will be available in the Windows Server code-name “Longhorn” timeframe and will provide a new, more versatile virtualization architecture fully compatible with today’s Microsoft Virtual Server implementations.¹⁰

Intel Virtualization Technology will be a critical foundation for this next-generation solution, and will help Microsoft to:

- Further reduce the size and complexity of the VMM to simplify development and improve security (by shrinking the attack surface).

“Over the next couple of years, virtualization will transform the way IT approaches the datacenter. Our early customers say that virtualized systems will be their default configuration in the future.”

— Mike Neil,
Product Unit Manager for
Microsoft Virtual Server,
Microsoft Windows
Virtualization and
Microsoft Virtual PC

- Support 64-bit guest OSs and multiple physical processors per VM to enable virtualization of large, heavily loaded back-end applications.
- Enable live VM transfers so server maintenance and capacity upgrades can be performed without downtime.

Moving forward, Intel and Microsoft virtualization technologies will have even more profound implications for business customers. By abstracting software from hardware, virtualization lays the foundation for automated datacenter management, in which IT organizations have full programmatic control of OSs, applications, and workloads. This is the goal of Microsoft’s Dynamic Systems Initiative (DSI), which is evolving today, and will take full advantage of capabilities provided by current and future Microsoft and Intel virtualization technologies.

Conclusion

Virtualization has become an essential technology for optimizing server environments, improving agility and reducing total costs. Together, Intel and Microsoft are simplifying implementation and reducing total costs for virtualization, by delivering and supporting optimized solution stacks that are more affordable, easier to integrate, and extensively tested across a wide range of hardware, OS, and application environments.

- Microsoft is providing Virtual Server 2005 R2 as a free download to reduce OS and application licensing costs, and delivering extensive support not only for Microsoft’s OSs and applications running in virtual machines but for selected Linux distributions as well.
- Intel is optimizing the entire server platform for virtualization, with Intel Virtualization Technology, 64-bit multi-core processors with Hyper-Threading Technology, leading RAS features, and a number of advanced platform technologies that boost memory and I/O performance and reliability.

Both companies are moving forward rapidly to improve and extend the combined solution, while maintaining compatibility with today’s implementations. As a result, IT organizations can standardize today on a high-value, enterprise-class virtualization solution that will provide a solid foundation for next-generation capabilities, so they can continue to drive down costs and improve infrastructure efficiency.

¹⁰ Windows virtualization will continue to use the same Virtual Hard Drive (VHD) format as Virtual Server 2005, so today’s virtual machines can be migrated into Microsoft’s next-generation virtualization environments.

ADDITIONAL RESOURCES

Microsoft

- Microsoft Virtual Server 2005 R2:
www.microsoft.com/windowsserversystem/virtualserver/default.mspx
- Microsoft Virtual Server 2005 R2 Download (free):
www.microsoft.com/windowsserversystem/virtualserver/software/default.mspx
- Microsoft Virtual Server Support:
www.microsoft.com/windowsserversystem/virtualserver/support/default.mspx

Intel

- Intel Xeon Processor-based Servers:
www.intel.com/business/bss/products/server/xeon/index.htm
- Intel Virtualization Technology:
www.intel.com/business/bss/products/server/virtualization.htm
- Intel® Solution Services:
www.intel.com/cd/services/intelsolutionservices/asmo-na/eng/index.htm

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